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New records and updated list of species in Gobiidae in the Hoi estuary of Ma River, Thanh Hoa province, Vietnam

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Abstract. Fieldwork in the Hoi estuary area of the Ma River has recorded nine species of Gobiidae. Three of these species are recorded for the first time in the study area, including *Acentrogobius caninus* (Valenciennes, 1837), *Glossogobius olivaceus* (Temminck & Schlegel, 1845), and *Oxyurichthys papuensis* (Valenciennes, 1837). We update the list of gobiid species in the Hoi estuary; it now includes 18 species.

Keywords. Gobies, new distribution, north-central Vietnam

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Introduction

Gobiidae includes species with a fairly wide distribution, found in most tropical and subtropical regions. Worldwide, 1,952 species of 263 genera have been recorded (FishBase 2023). In Vietnam there are currently 92 species known (Nguyen, 2001), and according to FishBase (2023) Vietnam has 156 species of gobiids belonging to 64 genera. The Ma River is a large river located in the territory of Laos and Vietnam. The Ma river basin has an area of about 28,400 km^2, of which about 17,600 km^2 is within the territory of Vietnam. Downstream, the Ma River flows into the sea in three estuaries: Sung, Lach Truong and Hoi estuaries; the Hoi estuary is the largest of the three and belongs to Hoang Hoa district and Sam Son city. During our fieldwork in the Hoi estuary in 2021 and 2022, we have collected 33 specimens of gobies. We have identified nine species among these materials, including three species are newly recorded from the study area.

Methods

Fieldwork was conducted from October to December 2021 and in May 2022 in the at 19°46′N; 105°52′E in Hoi estuary of the Ma River, Sam Son town, Thanh Hoa province, Vietnam. Thirty-three specimens were collected and examined (Table 1). Specimens were preserved and deposited at the Animal Laboratory at Hong Duc University, Thanh Hoa, Vietnam.

Technical terms and measurements follow Chen and Kottelat (2005). The characteristics analyzed include: standard length (SL), body depth, head length, predorsal length, preanal length, prepelvic length, caudal peduncle depth, caudal peduncle length, snout length, eye diameter, and interorbital width. CH: Abbreviation for specimens collected in Hoi estuary.

Results

List of species in the Gobiidae recorded in the Hoi estuary of the Ma River

Our analysis of 33 specimens collected in 2021 and 2022 have identified nine species belonging to six genera of Gobiidae, of which the genus *Acentrogobius* has three species and *Glossogobius* has two species. The genera *Chaeturichthys*, *Oxyurichthys*, *Tridentiger*, and *Taenioides* each have one species (Table 2).

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Table 1. List of specimens list and sampling dates.

Specimen	Species	Date
CH66	*Acentrogobius caninus*	20 October 2021
CH67	*Acentrogobius caninus*	20 October 2021
CH70	*Oxyurichthys papuensis*	20 October 2021
CH71	*Oxyurichthys papuensis*	20 October 2021
CH72	*Oxyurichthys papuensis*	20 October 2021
CH73	*Oxyurichthys papuensis*	20 October 2021
CH74	*Oxyurichthys papuensis*	20 October 2021
CH101	*Glossogobius olivaceus*	17 November 2021
CH102	*Glossogobius olivaceus*	17 November 2021
CH120	*Glossogobius giuris*	6 December 2021
CH121	*Acentrogobius viridipunctatus*	6 December 2021
CH122	*Acentrogobius viridipunctatus*	6 December 2021
CH123	*Acentrogobius viridipunctatus*	6 December 2021
CH124	*Acentrogobius viridipunctatus*	6 December 2021
CH125	*Acentrogobius viridipunctatus*	6 December 2021
CH126	*Acentrogobius viridipunctatus*	6 December 2021
CH127	*Acentrogobius viridipunctatus*	6 December 2021
CH128	*Acentrogobius viridipunctatus*	6 December 2021
CH129	*Acentrogobius viridipunctatus*	6 December 2021
CH130	*Acentrogobius viridipunctatus*	6 December 2021
CH131	*Acentrogobius viridipunctatus*	6 December 2021
CH132	*Glossogobius giuris*	6 December 2021
CH169	*Glossogobius olivaceus*	6 December 2021
CH170	*Glossogobius olivaceus*	6 December 2021
CH171	*Tridentiger trigonocephalus*	6 December 2021
CH172	*Tridentiger trigonocephalus*	6 December 2021
CH173	*Glossogobius giuris*	6 December 2021
CH174	*Acentrogobius viridipunctatus*	6 December 2021
CH175	*Acentrogobius chlosostigmatoides*	6 December 2021
CH176	*Chaeturichthys stigmatias*	6 December 2021
CH280	*Taenioides eruptionis*	21 May 2022
CH281	*Taenioides eruptionis*	21 May 2022
CH282	*Taenioides eruptionis*	21 May 2022

Table 2. List of species of Gobiidae recorded in 2021 and 2022 in the Hoi estuary of the Ma River, Thanh Hoa province, Vietnam.

No.	Species	No. of specimens
1	*Acentrogobius caninus* (Valenciennes, 1837)	2
2	*Acentrogobius chlosostigmatoides* (Bleeker, 1849)	1
3	*Acentrogobius viridipunctatus* (Valenciennes, 1837)	12
4	*Chaeturichthys stigmatias* Richardson, 1844	1
5	*Glossogobius giuris* (Hamilton, 1822)	3
6	*Glossogobius olivaceus* (Temminck & Schlegel, 1845)	4
7	*Oxyurichthys papuensis* (Cuvier et Valenciennes, 1837)	5
8	*Tridentiger trigonocephalus* (Gill, 1858)	2
9	*Taenioides eruptionis* (Bleeker, 1849)	3

New records for Hoi eastury of Ma River

Acentrogobius caninus (Valenciennes, 1837)

Figure 1

New records. VIETNAM – **Thanh Hoa Province** • Sam Son town, Hoi estuary; 19°46′N, 105°52′E; 20.X.2021; Quach Thi Thao & Trinh Thi Thu leg.; collected from fishermen's boats fishing in the coastal area; 2 specimens, sex indeterminate, CH.66, CH.67 (Fig. 1).

Identification. The studied specimens have morphological characteristics consistent with the description of Rainboth (1996).

Morphometrics: SL 93.2–101.8 mm; 17–18 predorsal scale rows; 10–11 transverse scale rows; 25–26 scales in lateral series; first dorsal VI, second dorsal I,9; anal rays 9; pectoral rays 18–19.

Proportions as percentage of SL: body depth 19.07 (17.98–20.17); head length 29.69 (29.67–29.72); predorsal length 33.72 (33.01–34.44); preanal length 60.37 (58.37–62.38); prepelvic length 30.40 (29.57–31.22); caudal peduncle depth 10.55 (8.45–12.66); caudal peduncle length 15.87 (15.42–16.31). Proportions as percentage of HL: snout length 25.47 (23.47–27.48); eye diameter 20.46 (18.54–22.38); interorbital width 10.16 (9.39–10.93).

Maxilla extending to anterior part of eye; naked cheek, upper part of opercles scaled. In preserved specimens: body light brown to gray, sides of head with many small dots; five large black streaks with five alternating spots along middle of body; large black spot at base of caudal fin; a large black (blue when alive) spot above of pectoral-fin base.

Glossogobius olivaceus (Temminck & Schlegel, 1845)

Figure 2

New records. VIETNAM – **Thanh Hoa Province** • Sam Son town, Hoi estuary; 19°46′N; 105°52′E; 17.XI.2021; Quach Thi Thao & Trinh Thi Thu leg.; specimens collected from fishermen's boats fishing in the coastal area; 2 specimens, sex indeterminate, CH.101, CH.102 • same locality; 06.XII.2021; Trinh Thi Thu leg.; specimens collected from fishermen's boats fishing in the

Figure 1. *Acentrogobius caninus* (CH.67).

Figure 2. *Glossogobius olivaceus* (CH.170).

coastal area; 2 specimens, sex indeterminate, CH.169, CH.170 (Fig. 2).

Identification. The studied specimens have morphological characteristics consistent with the description by Kwun (2020).

Morphometrics: SL 98.7–120.2 mm; first dorsal VI, second dorsal I,9; anal I,8; pectoral rays 19–20; 30–32 scales in lateral series; 21–24 predorsal scale rows.

Proportions as percentage of SL: body depth 20.03 (18.29–21.07); head length 31.97 (29.75–33.36); predorsal length 36.91 (33.76–40.73); preanal length 61.06 (58.87–63.02); prepelvic length 30.80 (29.30–33.11); caudal peduncle depth 10.61 (9.28–11.81); caudal peduncle length 16.06 (14.92–17.33). Proportions as percentage of HL: snout length 32.73 (28.27–34.77); eye diameter 20.08 (18.75–21.19); interorbital width 17.42 (9.82–27.81).

In ethanol: head and body dark brownish, abdominal region whitish, with several small blackish dots on nape; lateral region of body with four or five blackish blotches. Membranes of dorsal and caudal fin with several small darkish dots; membranes of anal fin and pelvic disc with whitish margins.

Oxyurichthys papuensis (Cuvier & Valenciennes, 1837)

New records. VIETNAM – **Thanh Hoa Province** • Sam Son town, Hoi estuary; 19°46′N; 105°52′E; 20.X.2021; Quach Thi Thao & Trinh Thi Thu leg., specimens collected from fishermen's boats fishing in the coastal area; 5 specimens, sex indeterminate, CH.70 (Fig. 3), CH.71, CH.72, CH.73, CH.74.

Identification. The morphological characteristics of the studied specimens are consistent with the description of Pezold and Larson (2015).

Morphometrics: SL 101.6–112.6 mm, first dorsal VI, second dorsal I,12; anal I,13; pectoral rays 21–24; caudal 13–15; lateral scales 56–60; predorsal scale rows 17–20.

Proportions as percentage of SL: body depth 17.95 (17.20–18.69); head length 24.69 (24.32–25.24); predorsal length 29.06 (27.71–29.67); preanal length 51.09 (50.18–52.60); prepelvic length 23.93 (21.85–25.22); caudal peduncle depth 10.64 (9.41–11.38); caudal peduncle length 10.85 (9.68–13.19). Proportions as percentage of HL: snout length 32.67 (30.18–35.96); eye diameter 25.00 (23.38–26.97); interorbital width 7.36 (5.62–8.76).

Head and body light yellowish to brownish, with

Figure 3. *Oxyurichthys papuensis* (CH.70).

some grey or dark brown markings. Four rounded to oval, brown blotches along middle of body and a distinct, black to blackish, triangular blotch at caudal-fin base (brown in ethanol); eight or nine vertical brown to greyish-brown bars along side of body.

Discussion

Among the 156 species of Gobiidae in Vietnam, the genus *Acentrogobius* has three species, which include *A. caninus*, *A. chlorostigmatoides*, and *A. viridipunctatus*; there was another species in *Acentrogobius*, but it has now been transferred to *Yongeichthys* Whitley, 1932: this is *Y. nebulosus* (Forsskål, 1775) (Fricke et al. 2023). The genus *Glossogobius* has four species, including *G. aureus*, *G. giuris*, *G. olivaceus*, and *G. sparsipapillus*, and *Oxyurichthys* has four species, including *O. microlepis*, *O. ophthalmonema*, *O. papuensis*, and *O. tentacularis*.

In the estuaries of Thanh Hoa province, several studies have been done: Duong Quang Ngoc (2007) recorded 263 species belonging to 58 families (12 species of Gobiidae) in the Ma river basin, including the Hoi estuary, and Nguyen Xuan Huan et al. (2014) recorded 14 species of Gobiidae studied in the Hoi estuary. Compared to these studies, our results found three additional species—*Acentrogobius caninus*, *Glossogobius olivaceus*, and *Oxyurichthys papuensis*—in the fish fauna of the Hoi estuary in particular and Thanh Hoa province in general. Thus, synthesizing the above studies and our results here, the number of gobiids in the Hoi estuary is updated to include 18 species belonging to 13 genera (Table 3).

Studies in estuaries and coastal areas of Vietnam have shown that *Acentrogobius caninus* has a fairly wide distribution and has been recorded in many locations (Fig. 4): Ba Lat estuary, Nam Dinh province (Nguyen et al. 2013); Nhat Le estuary, Quang Binh province

Table 3. Updated list of species of Gobiidae in the Hoi estuary of the Ma River.

Species	This study	Nguyen et al. 2014	Duong 2007
Acanthogobius flavimanus (Temminck & Schlegel, 1845)		+	
Acentrogobius caninus (Valenciennes, 1837)	+		
Acentrogobius chlosostigmatoides (Bleeker, 1849)	+	+	+
Acentrogobius viridipunctatus (Valenciennes, 1837)	+	+	
Aulopareia janetae Smith, 1945		+	
Chaeturichthys stigmatias Richardson, 1844	+	+	+
Favonigobius gymnauchen (Bleeker, 1860)		+	+
Glossogobius giuris (Hamilton, 1822)	+	+	+
Glossogobius olivaceus (Temminck & Schlegel, 1845)	+		
Glossogobius sparsipapillus Akihito & Meguro, 1976		+	+
Mugilogobius abei (Jordan & Snyder, 1901)			+
Odontamblyopus rubicundus (Hamilton, 1822)		+	+
Oligolepis acutipennis (Valenciennes, 1837)		+	+
Oxyurichthys papuensis (Cuvier et Valenciennes, 1837)	+		
Taenioides eruptionis (Bleeker, 1849)	+	+	+
Tridentiger barbatus (Günther, 1861)		+	+
Tridentiger trigonocephalus (Gill, 1858)	+	+	+
Trypauchen vagina (Bloch & Schneider, 1801)		+	+
Total	**9**	**14**	**12**

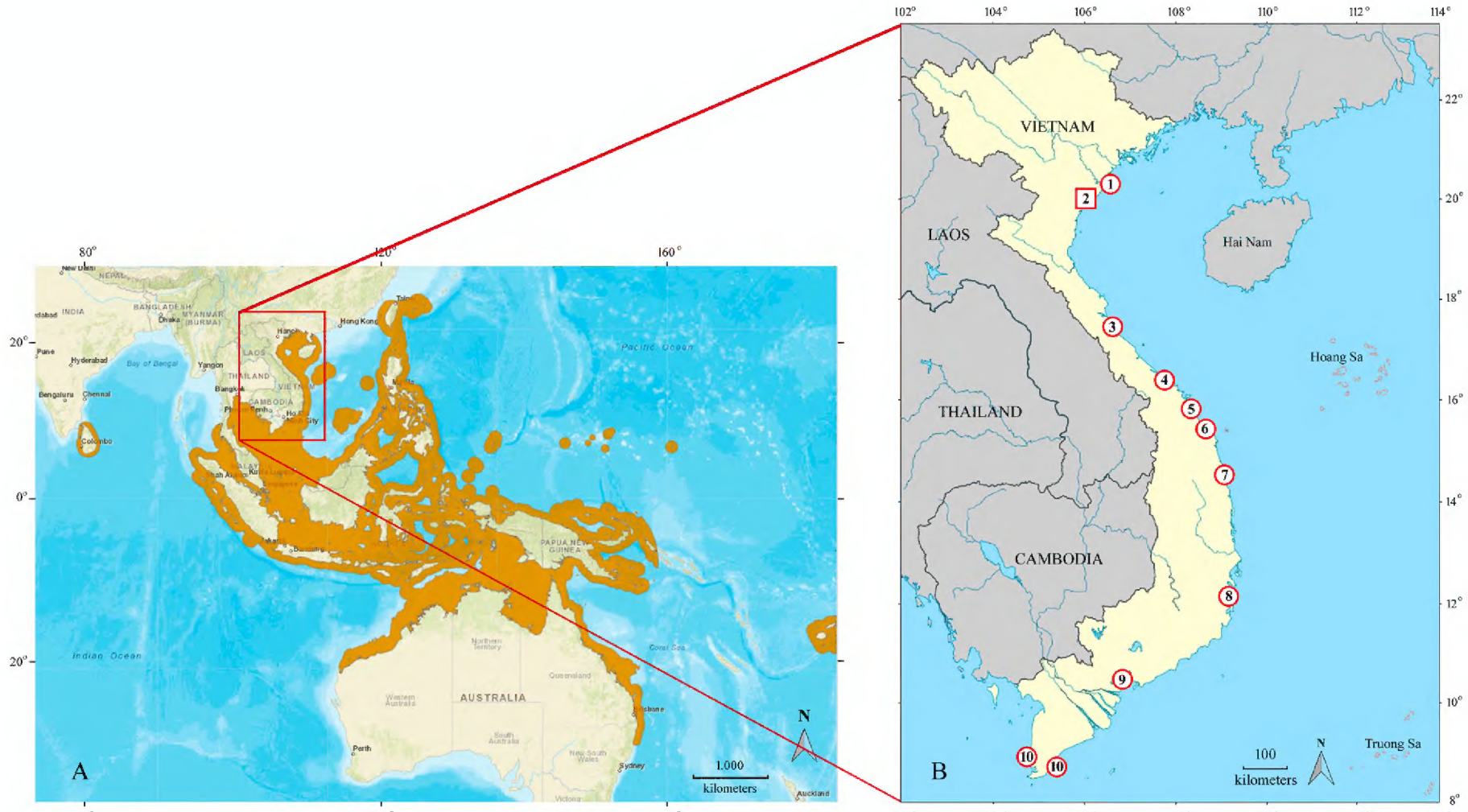

Figure 4. Distribution of *Acentrogobius caninus*. **A.** Worldwide (edited from: IUCN 2023). **B.** In Vietnam (1 = Ba Lat estuary; 2 = Hoi estuary, Sam Son town; new records; 3 = Nhat Le estuary; 4 = Bu Lu River; 5 = Thu Bon River; 6 = Quang Nam coastal wetlands; 7 = Quang Ngai coastal area; 8 = Binh Cang-Nha Phu; 9 = Lower Sai Gon River; 10 = Ca Mau coastal area. Modified from Luu Ly and Uwe Derering).

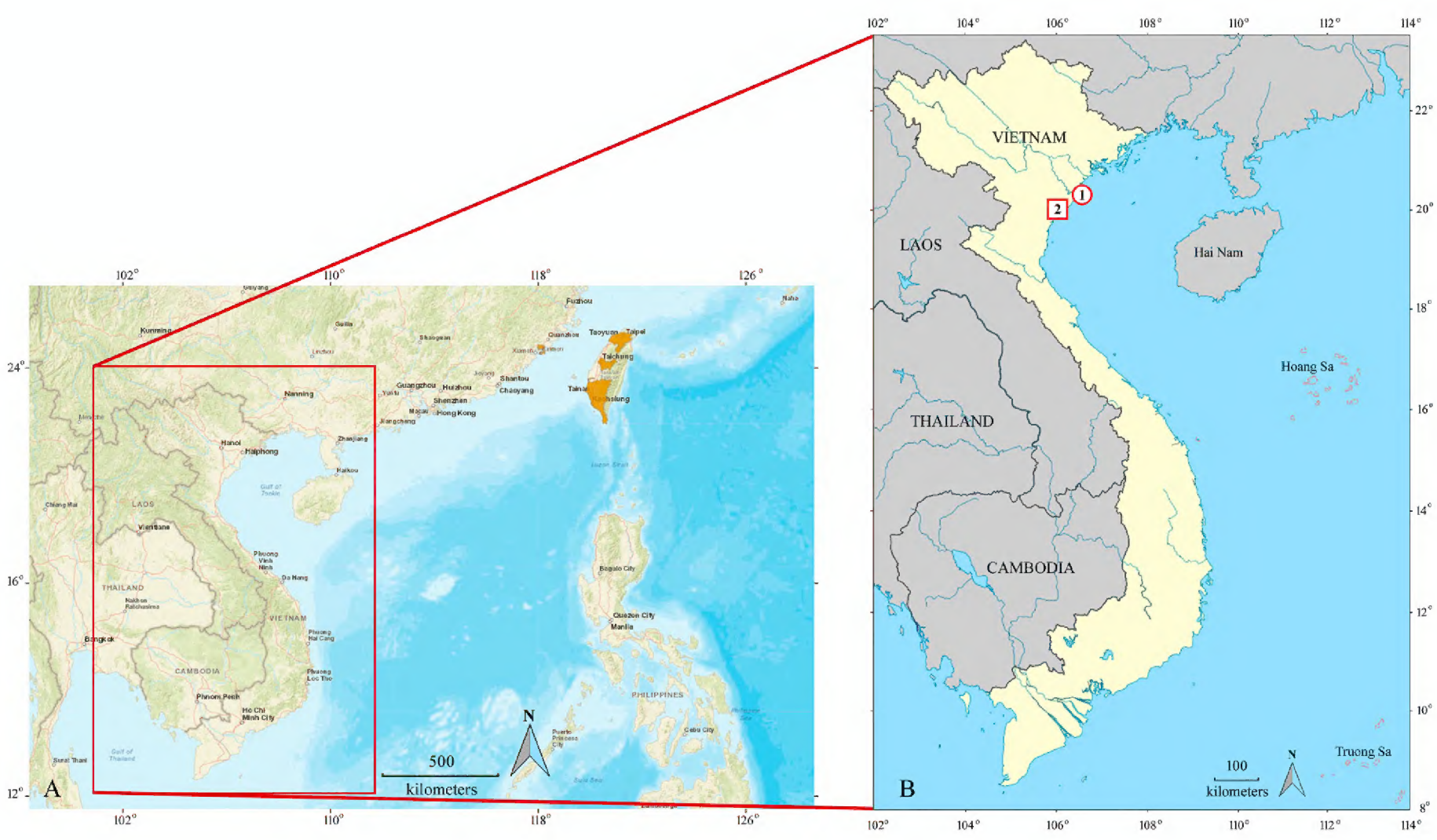

Figure 5. Distribution of *Glossogobius olivaceus*. **A.** Worldwide (edited from: IUCN 2023). **B.** In Vietnam (1 = Ba Lat estuary, Nam Dinh province; 2. Hoi estuary, Sam Son town; new records. Edited from: Luu Ly and Uwe Derering).

(Nguyen et al. 2015); Bu Lu River, Thua Thien-Hue province (Vo and Tran 2008); Thu Bon River, Quang Nam province (Nguyen et al. 2015); Quang Nam coastal wetlands (Le and Nguyen 2009); Quang Ngai coastal (Le et al. 2018); Binh Cang-Nha Phu, Khanh Hoa province (Vo et al. 2013); lower Sai Gon River (Nguyen 2015); Ca Mau coastal (Nguyen et al. 2020). According to Fishbase (2023), the distribution of this species is very large, among includes the all coastal waters of Vietnam. However, this species has not been reported from Thanh Hoa province until now.

Glossogobius olivaceus and *Oxyurichthys papuensis* are more narrowly distributed. *Glossogobius olivaceus* occurs across East Asia, including the Philippines,

China, Taiwan, Japan, and Russia, as well as Africa, including South Africa and Madagascar, and Kwun (2020) confirmed its presence in Korea, in an estuarine region in Ulsan. In Vietnam, *G. olivaceus* has only been recorded in the Ba Lat estuary, Nam Dinh province (Nguyen et al. 2013). Here, we expand the distribution of *G. olivaceus* to Southern Vietnam, about 86 km from Ba Lat estuary to the Hoi estuary (Fig. 5).

According to Pezold and Larson (2015), *Oxyurichthys papuensis* is occurs in New Caledonia, Papua New Guinea, Palau, Japan, Taiwan, Indonesia, Philippines, Seychelles, East Africa, and the Persian Gulf. In Vietnam, *O. papuensis* was recorded in the coastal wetlands of Quang Nam province (Le and Nguyen 2009) and Thu Bon River, Quang Nam province (Nguyen et al. 2015). We expand the distribution of *O. papuensis* to Northern Vietnam by about 560 km from Quang Nam province to Hoi estuary (Fig. 6).

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Author Contributions

Data curation: HNT. Formal analysis: TTT. Methodology: HNT, TTT. Supervision: HNT. Writing – original draft: TTT. Writing – review and editing: HNT.

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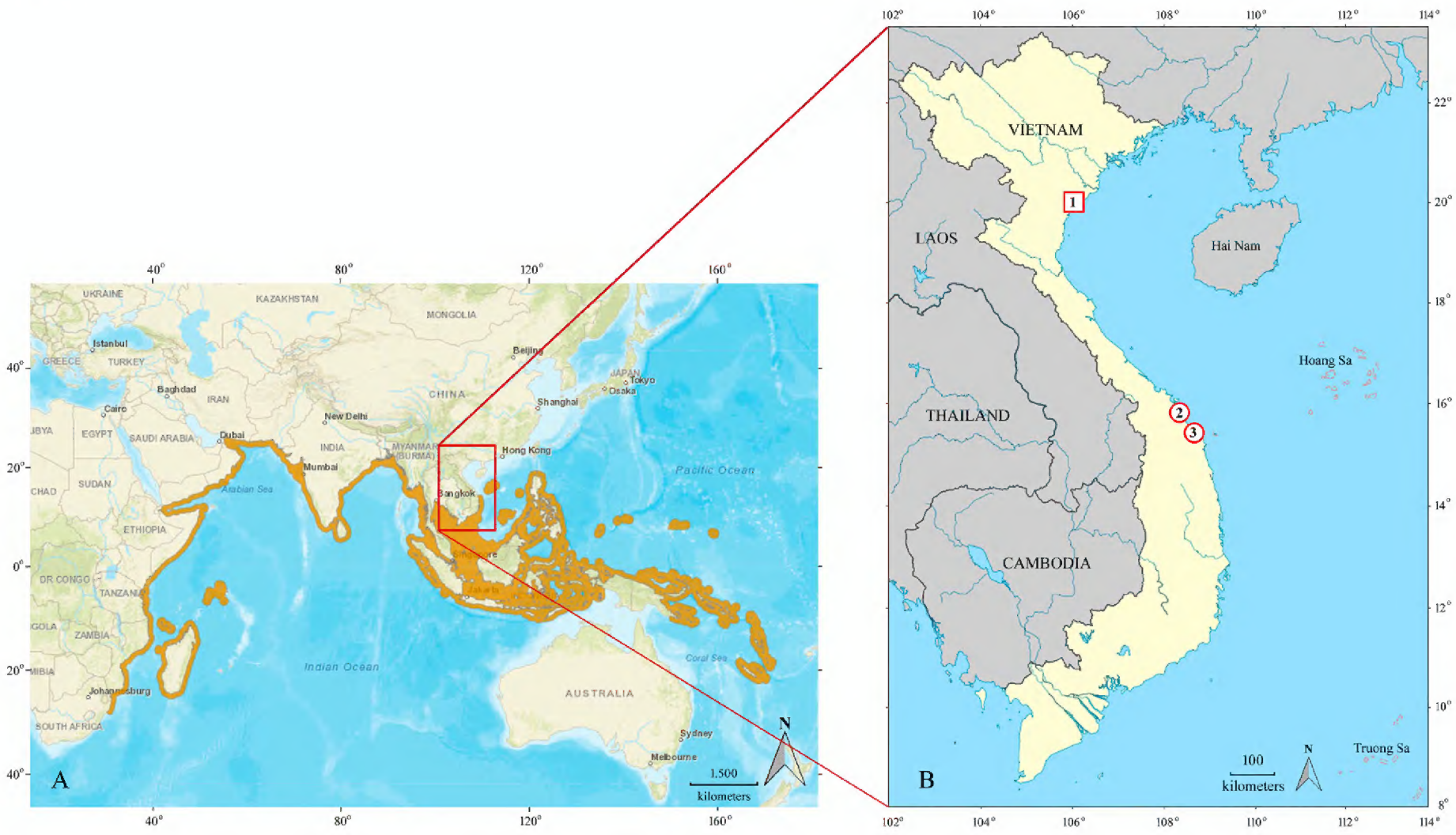

Figure 6. Distribution of *Oxyurichthys papuensis*. **A.** Worldwide (source: edited from IUCN, 2023). **B.** In Vietnam (1 = Hoi estuary, Sam Son town, Thanh Hoa province; new records; 2 = coastal wetlands of Quang Nam province; 3 = Lower Thu Bon River, Quang Nam province. Edited from: Luu Ly and Uwe Derering).

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